

(19) Europäisches Patentamt

European Patent Office

Office européen des brevets



(11) EP 0 969 134 A1

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:  
05.01.2000 Bulletin 2000/01(51) Int. Cl.<sup>7</sup>: D06F 37/26, D06F 37/20

(21) Application number: 98308217.3

(22) Date of filing: 08.10.1998

(84) Designated Contracting States:  
 AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
 MC NL PT SE  
 Designated Extension States:  
 AL LT LV MK RO SI

(30) Priority: 02.07.1998 KR 9826509

(71) Applicant:  
 Samsung Electronics Co., Ltd.  
 Suwon-city, Kyungki-do (KR)

(72) Inventor: Jang, Sam-young  
 416 Maetan-dong, Paldal-gu, Suwon-city, (KR)

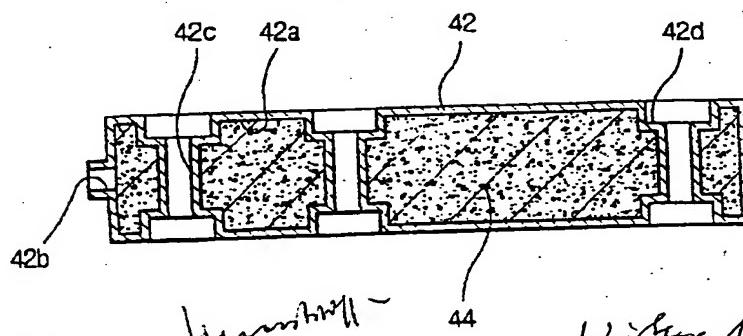
(74) Representative:  
 Geary, Stuart Lloyd et al  
 Verner, Shipley & Co.,  
 20 Little Britain  
 London EC1A 7DH (GB)

## (54) Washing machine

(57) A washing machine is disclosed and includes a tub (12) housing a rotatably mounted drum (14). The tub (12) has a counterbalance weight (44) for reducing vibration of the tub (12) caused by uneven distribution of

laundry within the drum (14) during rotation. The counterbalance weight (44) is contained in a housing (42).

FIG. 3B



Halterung  
Wippe  
gefüllt  
Wäsche für DE  
entfernen am

28.07.2000

EP 0 969 134 A1

**Description**

[0001] The present invention relates to a washing machine including a tub housing a rotatably mounted drum, the tub having a counterbalance weight attached thereto for reducing vibration of the tub caused by uneven distribution of laundry within the drum during rotation.

[0002] A conventional washing machine has a rotatably mounted drum installed horizontally in a tub suspended within a housing. The drum can be rotated in both clockwise and anti-clockwise directions. Water is supplied to the drum from a mains supply to wash laundry. During a wash cycle, vibration and noise is generated due to imbalanced rotation caused by an uneven distribution of laundry within the drum. To counterbalance the drum, a weight is mounted on the tub which reduces the vibration and noise.

[0003] A conventional washing machine of the above described type is shown in Figures 1 and 2 and comprises a housing 10, a tub 12 suspended within the housing 10, a drum 14 rotatably mounted within the tub 12, and a motor 16 for driving the drum 14.

[0004] A detergent container 18 is mounted in the housing 10 for supplying detergent together with water into the drum 14, and a control panel 20 is mounted on the housing to enable a user to select various operating parameters.

[0005] A plurality of openings are provided in the drum 14 to enable water to pass between the tub 12 and the drum 14. A shaft (not shown) to which a pulley is assembled is fixed to the rear face of the drum 14.

[0006] A belt extends between the motor and the pulley so that drive can be transmitted to the drum 14 through the belt.

[0007] The tub 12 includes a face 22 and a tub gasket 24 on its front and rear sides respectively. A plurality of brackets 26 extend over the front face 22 and the curved cylindrical surface of the tub 12. A plurality of keyhole shaped openings 26a are formed in the part of each bracket 26 that extends over the front face 22 of the drum 14. The threaded end of a bolt 30 extends from each of the keyhole shaped openings 26a.

[0008] A counterbalance weight 36 made of concrete is mounted to the front face 22 and reduces the vibration and noise caused by the rotation of the drum 14. The bolts 30 extend into holes 36a in the counterbalance weight and the weight is retained in position by nuts 28 screwed onto the ends of the bolts 30. Washers 32 and 34 are disposed between the counterbalance weight 36 and the brackets 26, and between the counterbalance weight 36 and the nuts 28. The washers 32 and 34 are inserted into recesses 36b formed in both sides of the counterbalance weight 36a surrounding the holes 36a.

[0009] When the laundry is placed in the drum 14 and the door 38 is closed, the washing machine operates in accordance with settings input via the control panel 20.

The wash cycle is performed as the drum rotates and vibration noise caused by rotation of the drum 14 are suppressed by the counterbalance weight 36.

[0010] A problem with the aforementioned conventional washing machine that because the weight balancer 36 is made of concrete, it may very easily crack. This can be caused by overtightening the nuts 28 when the counterbalance weight 36 is fixed to the tub 12. The existence of a crack in the counterbalance weight 36 substantially reduces its effectiveness in reducing vibration and noise and so it is necessary to ensure that the nuts are not overtightened. However, this can be difficult.

[0011] In addition, a conventional weight balancer is made by injecting a cement mixture into a mold in which it is allowed to harden. This increases cost as a mold has to be made and the process for making it is labour intensive.

[0012] A washing machine according to the present invention is characterised in that the counterbalance weight is contained in a housing.

[0013] Preferably, the housing includes a cavity to accommodate the counterbalance weight.

[0014] The counterbalance weight is preferably a cement mixture, the housing including a port through which the cement mixture can be poured or injected into the cavity before it hardens.

[0015] An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a prior art washing machine;

Figure 2 is a sectional view of a part of the prior art washing machine of Figure 1, showing how the counterbalance weight is mounted on the tub;

Figure 3a is a perspective view of a weight balancer in accordance with the invention;

Figure 3b is a sectional view of Figure 3a taken along the line IIIb-IIIb, which shows the inner structure of the weight balancer according to the invention; and

Figure 4 is a sectional view of a part of Figure 3b which shows the installation structure of the counterbalance weight according to the invention.

[0016] As shown in Figures 3a and 3b, the counterbalance weight comprises a housing 42, in which is accommodated a concrete weight 44.

[0017] The housing 42 is moulded and defines a cavity 42a. An injection port 42b enables cement mixture to be injected into the cavity 42a. A plurality of holes 42c extend through the weight housing 42 and assembly members 30 (shown in Figure 4) pass through the holes 42c. Insertion recesses 42d are formed in the face of the housing 42 at either end of the holes 42c. Washers 32 and 34 are received in the recesses 42d.

[0018] A method of manufacturing a counterbalance

weight having the structure described above will now be described.

[0019] The weight housing 42 is initially formed in a molding operation and when complete, cement mixture is injected into the cavity 42a through the injection port 42b and left to harden.

[0020] When manufacture of the counterbalance weight is complete, it is mounted on the face 22 of the tub in a similar way to that of the prior art. The bolts 30 pass through the holes 42c of the counterbalance weight 40 and the nuts 28 are screwed onto the free ends of bolts 30 that extend through the counterbalance weight 40. The washers 32 and 34 are inserted into the recesses 42d on either side of the counterbalance weight and serve to dissipate the load when the nuts are tightened.

[0021] According to the preferred embodiment, as a cement mixture is injected into a housing, a mold for forming the cement mixture to the required shape is not required.

[0022] Furthermore, when the nuts are tightened, the load is applied to the weight housing rather than the concrete weight itself. Thus, cracks in the concrete weight are avoided even when excessive force is applied to the nuts to tighten them.

#### Claims

1. A washing machine including a tub (12) housing a rotatably mounted drum (14), the tub (12) having a counterbalance weight attached thereto (44) for reducing vibration of the tub (12) caused by uneven distribution of laundry within the drum (14) during rotation, characterised in that the counterbalance weight (44) is contained in a housing (42).
2. A washing machine according to claim 1 wherein the housing (42) includes a cavity (42a) to accommodate the counterbalance weight (44).
3. A washing machine according to claim 2 wherein the counterbalance weight (44) is a cement mixture, the housing (42) including a port (42b) through which the cement mixture can be poured into the cavity (42a) before it hardens.
4. A method of manufacturing a washing machine according to claim 3 including the steps of moulding a housing (42) and pouring the cement mixture into the housing (42).
5. A method of manufacturing a washing machine according to claim 4 including the steps of allowing the cement mixture to harden and attaching the housing (42) to the tub (12) of the washing machine.
6. A weight balancer of a drum type washing machine,

said weight balancer for reducing vibrations and noise of a tub caused by a rotation of a drum during an operation of said drum type washing machine, said weight balancer comprising a weight housing being installed at a front of said tub, said weight housing having a cavity therein, and a concrete weight being accommodated in said cavity of said weight housing.

- 10 7. The weight balancer as claimed in claim 6 wherein said weight housing has an injection port for injecting mortar for forming said concrete weight thereinto, and a plurality of holes through which assembly members pass respectively so as to be assembled with said tub.
- 15 8. A method for manufacturing a weight balancer of a drum type washing machine said method comprising the steps of preparing a mold for forming a weight housing, molding said weight housing with said mold, said weight housing having an injection port for injecting mortar thereinto and having a plurality of holes, injecting mortar for forming a concrete weight through said injection port of said weight housing and hardening said mortar.

30

35

40

45

50

55

FIG. 1

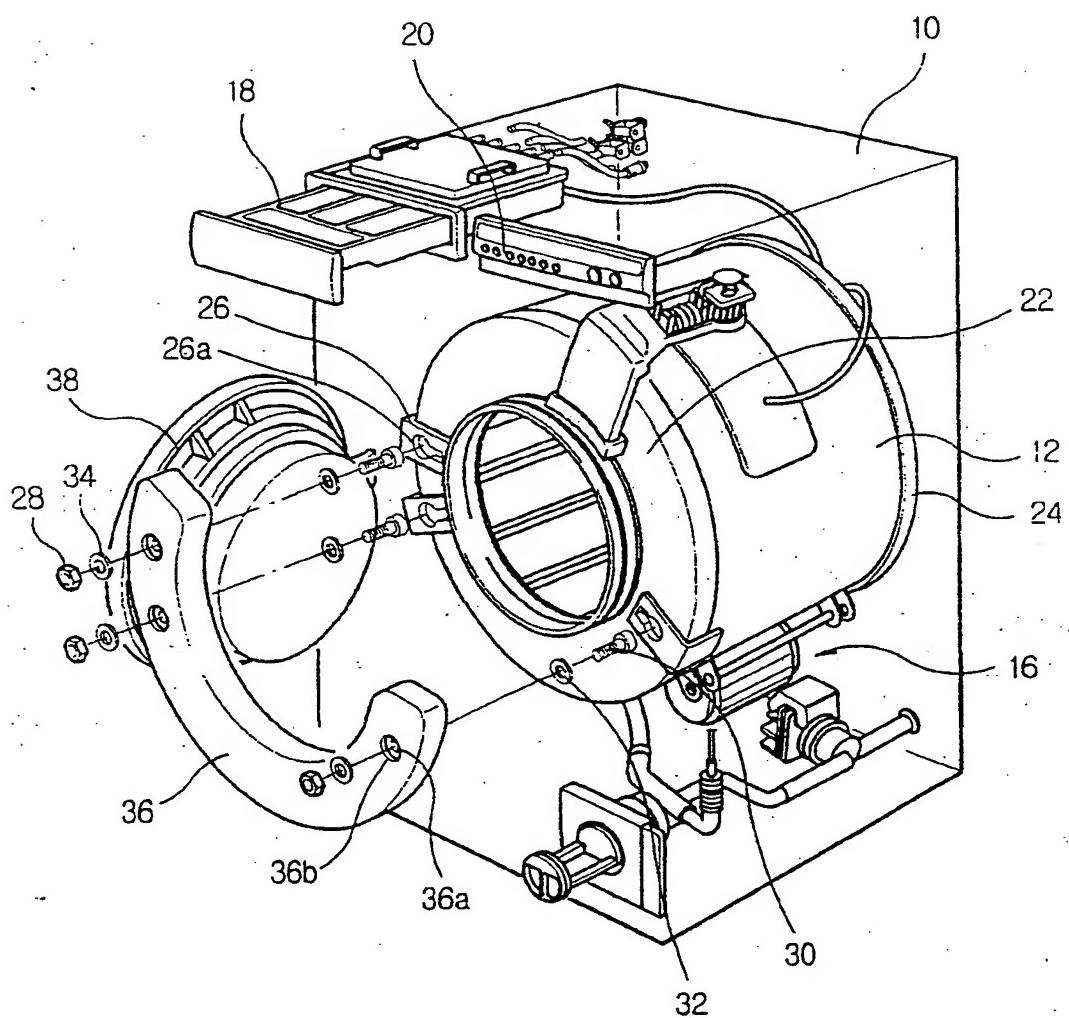


FIG. 2

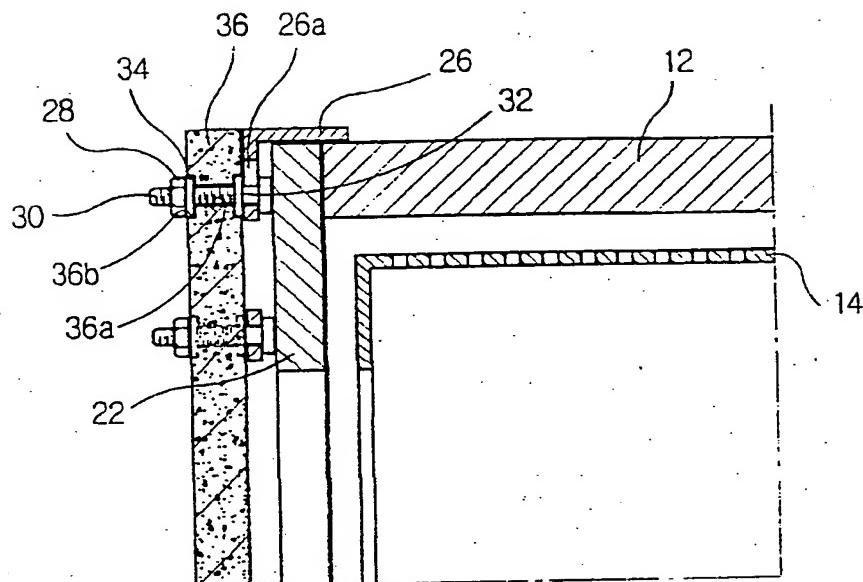


FIG. 3A

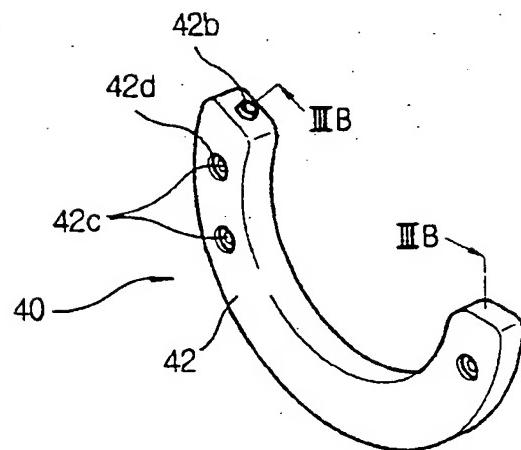


FIG. 3B

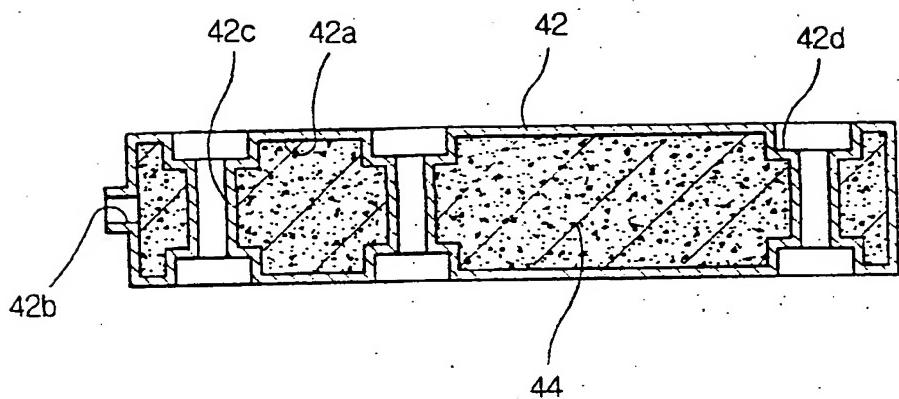
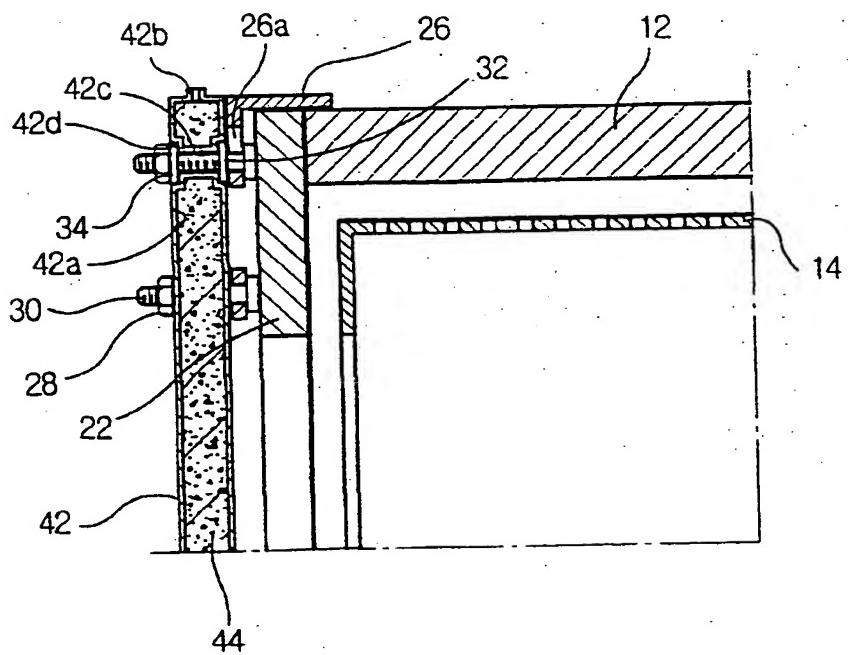


FIG. 4





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 98 30 8217

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.6)						
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim							
X	EP 0 812 946 A (ELECTROLUX ZANUSSI ELETTRODOMESTICI S.P.A.) 17 December 1997 * the whole document *	1-8	D06F37/26 D06F37/20						
X	EP 0 623 436 A (S. PESCATORI) 9 November 1994 * the whole document *	1-8							
X	DE 90 15 420 U (INDUSTRIE ZANUSSI S.P.A.) 31 January 1991 * claims; figures *	1,2,6							
X	EP 0 601 347 A (ZANUSSI ELETTRODOMESTICI S.P.A.) 15 June 1994 * column 3, line 13 - line 16 * * column 3, line 51 - column 4, line 1; figure 1 *	1,2							
A	US 4 502 303 A (WHITE CONSOLIDATED INDUSTRIES INC.) 5 March 1985 * column 5, line 66 - column 6, line 19; figures 2,5,6 *	1-8	TECHNICAL FIELDS SEARCHED (Int.Cl.6)  D06F						
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>THE HAGUE</td> <td>8 March 1999</td> <td>Courrier, G</td> </tr> </table> <p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document</p>				Place of search	Date of completion of the search	Examiner	THE HAGUE	8 March 1999	Courrier, G
Place of search	Date of completion of the search	Examiner							
THE HAGUE	8 March 1999	Courrier, G							

ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 98 30 8217

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
 The members are as contained in the European Patent Office EDP file on  
 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-03-1999

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 812946	A	17-12-1997	IT	PN960038 A	11-12-1997
EP 623436	A	09-11-1994	IT	1264151 B	16-09-1996
DE 9015420	U	31-01-1991	IT	222406 Z	01-04-1995
			FR	2654443 A	17-05-1991
			GB	2241251 A, B	28-08-1991
EP 601347	A	15-06-1994	IT	1259238 B	11-03-1996
			CN	1090900 A	17-08-1994
			DE	69307668 D	06-03-1997
			DE	69307668 T	28-05-1997
			ES	2099348 T	16-05-1997
			JP	6205889 A	26-07-1994
			US	5419164 A	30-05-1995
US 4502303	A	05-03-1985	AU	570515 B	17-03-1988
			AU	3474884 A	09-05-1985
			AU	577226 B	15-09-1988
			AU	7627487 A	29-10-1987
			CA	1223748 A	07-07-1987
			CA	1228741 C	03-11-1987
			JP	1370153 C	25-03-1987
			JP	60114295 A	20-06-1985
			JP	61034839 B	09-08-1986
			US	4519223 A	28-05-1985

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS**
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- FADED TEXT OR DRAWING**
- BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- SKEWED/SLANTED IMAGES**
- COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- GRAY SCALE DOCUMENTS**
- LINES OR MARKS ON ORIGINAL DOCUMENT**
- REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- OTHER: \_\_\_\_\_**

**IMAGES ARE BEST AVAILABLE COPY.**

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.